

What is claimed is:

1 1. A method, comprising:
2 storing a first data structure containing costs associated with
3 transmitting data between routers in a network;
4 combining the first data structure with itself to determine a cost of
5 transmitting the data; and
6 transmitting the data along a route based on the calculated cost.

1 2. The method of claim 1, further comprising storing a second data
2 structure defining router connections in the network.

1 3. The method of claim 2, wherein storing the second data structure
2 comprises storing a matrix defining router connections.

1 4. The method of claim 3, wherein storing the first data structure
2 comprises storing a matrix, wherein the costs are based on at least one of a
3 distance, reliability, security, or expense of transmitting the data between routers
4 in the network.

1 5. The method of claim 4, wherein combining the first data structure
2 with itself calculates the cost of transmitting the data between a source router
3 and destination router in the network for a given number of steps at minimal
4 cost.

1 6. The method of claim 5, wherein the transmitting the data along the
2 route further comprises determining the route between the source router and the
3 destination router based on the cost and the connection matrix.

1 7. The method of claim 2, further including determining the second
2 data structure.

1 8. The method of claim 1, wherein transmitting the data comprises
2 transmitting an IP data packet.

1 9. The method of claim 1, further including determining the first data
2 structure.

1 10. An apparatus, comprising:
2 an interface adapted to receive a data packet;
3 at least one storage device to store:
4 a first data structure defining router connections in a
5 network; and
6 a second data structure that defines a cost associated with
7 links between routers in the network; and
8 a controller adapted to:
9 combine the second data structure with itself at least once
10 to determine a cost for transmitting the data packet; and
11 determine a route based on the first data structure and the
12 calculated cost for transmitting the data packet.

1 11. The apparatus of claim 10, wherein the first data structure
2 comprises a first matrix that defines the router connections in the network
3 wherein the router connections comprise adjacent router connections.

1 12. The apparatus of claim 11, wherein the second data structure
2 comprises a second matrix that defines the cost associated with each link
3 between adjacent routers as exponents.

1 13. The apparatus of claim 12, wherein the cost of each link between a
2 router and itself is defined as zero and the cost for each link from a router to a
3 non-adjacent router is defined as infinity.

1 14. The apparatus of claim 13, wherein the controller is adapted to
2 combine the second matrix using the formula $\min_{1 \text{ to } k} (D_{ik} * D_{kj})$, wherein k is the
3 number of the routers and the second matrix is represented by D that has i rows
4 and j columns.

1 15. The apparatus of claim 14, wherein the controller is adapted to
2 increment k if a resulting element from combining the second matrix is one.

1 16. The apparatus of claim 12, wherein the costs are based on at least
2 one of a distance, reliability, security, or expense of transmitting the data packet
3 between the adjacent routers in the network.

1 17. The apparatus of claim 12, wherein the controller is further
2 adapted to combine the second matrix with itself a number of times until the
3 cost of transmitting the data packet between a source router and destination
4 router is minimum for a given number of steps.

1 18. The apparatus of claim 10, wherein the controller is adapted to
2 determine a direct connection between each link of the route based on the first
3 data structure.

1 19. The apparatus of claim 10, wherein the controller is further
2 adapted to transmit the data packet along the route.

1 20. The apparatus of claim 10, wherein the data packet is an IP data
2 packet.

1 21. An article comprising at least one machine-readable storage media
2 containing instructions for routing a data packet, the instructions when executed
3 causing a controller to:

4 represent node connections in a network in a first matrix;
5 represent costs of transmitting the data packet between each of a
6 plurality of nodes in a second matrix; and
7 determine a route to transmit the data packet based on the first matrix
8 and the second matrix.

1 22. The article of claim 21, wherein the instructions when executed
2 cause the processor to transmit the data packet over the route.

1 23. The article of claim 21, wherein the instructions when executed
2 cause the processor to represent adjacent node connections in the first matrix.

1 24. The article of claim 21, wherein the instructions when executed
2 cause the processor to represent the costs as exponents in the second matrix.

1 25. The article of claim 24, wherein the instructions when executed
2 cause the processor to represent a cost between each node and itself as zero
3 and each node to a non-adjacent node as infinity.

1 26. The article of claim 25, wherein the instructions when executed
2 cause the processor to combine the second matrix using the formula $\min_{1 \text{ to } k} (D_{ik}$
3 $* D_{kj})$, wherein k is the number of the routers and the second matrix is
4 represented by D that has i rows and j columns.

1 27. The apparatus of claim 26, wherein the instructions when executed
2 cause the processor to increment k if a resulting element from combining the
3 second matrix is one.

1 28. The article of claim 21, wherein the instructions when executed
2 cause the processor to represent the costs comprises the processor to represent
3 at least one of a distance, reliability, security, or expense of transmitting the data
4 packet between each of the plurality of nodes.

1 29. The article of claim 21, wherein the instructions when executed
2 cause the processor to combine the second matrix with itself a number of times
3 until the costs of transmitting the data packet between a source node and
4 destination node are minimum for a given number of steps.

1 30. The article of claim 21, wherein the instructions when executed
2 cause the processor to determine the route to transmit an IP data packet.

1 31. A data signal embodied in a carrier wave comprising instructions for
2 routing data packet to at least one of a plurality of network entities, the
3 instructions when executed causing a controller to:

4 store a connection matrix indicating adjacent nodes in a network;

5 store a cost matrix expressing transmission costs as exponents;

6 and

7 determine a route for transmitting the data packet based on the
8 connection and cost matrices from a first node to a second node.

1 32. The data signal of claim 31, wherein the instructions when
2 executed cause the processor to transmit the packet data over the route.

1 33. A communication system, comprising:
2 a source entity adapted to transmit a data packet;
3 a router capable of receiving the data packet, the router adapted
4 to:
5 define a cost matrix containing transmission costs associated
6 with routing the data packet between a pair of routers in a network;
7 determine a transmission cost of transmitting the packet
8 data to a destination entity based on the cost matrix; and
9 transmit the data packet to the destination entity using a
10 route associated with the transmission cost.

1 34. The communications system of claim 33, wherein the data packet is
2 an IP data packet.